UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Istituzioni di Matematica I

2021-1-E3002Q001

Aims

The student must acquire basic concepts and results of mathematical analysis in one real variable.

Contents

Numerical sets: natural, integer, rational, real and complex numbers. Functions of one real variable, limits, continuity, differentiability. Derivative of a function. Riemann integral and improper integral. Elementary notions of ordinary differential equations.

Detailed program

1. Natural numbers, integer numbers, rational numbers, real numbers. Complex numbers: cartesian and polar forms, De Moivre formula, roots of a complex number.

2. Real valued functions of one real variable. Domain, codomain, and image of a function. Injectivity, surjectivity, inverse of a function. Increasing and decreasing functions. Graph and main properties of elementary functions.

3. Limit of a function at a point. Computation of limits. Continuity; points of discontinuity.

4. Derivative of a function at a point, geometrical and physical intepretations. Tangent line. Differentiation rules. Non-differentiable points.

5. Maxima and minima of a function. Weierstrass theorem, Fermat theorem, Lagrange theorem, de l'Hospital rule. Convexity and inflection points.

6. Primitives of a function. Area of plane figures and the Riemann integral. Computation of definite integrals. Fundamental theorem of calculus. Integration by parts and by substitution. Improper integrals.

7. Ordinary differential equations. General solution and Cauchy problem. Linear equations of the first order. Method of separation of variables. Second order linear equations with constant coefficients.

Prerequisites

Elementary algebra, geometry, and trigonometry, as treated in high school classes or in the pre-courses of the present University.

Teaching form

Lectures (40h - 5 CFU), exercises classes (36h - 3 CFU).

During the Covid-19 emergency period, classes might take place in mixed mode: partial attendance and synchronous videotaped lessons. More information will be provided by the beginning of the classes.

Textbook and teaching resource

Reference book:

• J. Stewart, Calcolo. Funzioni di una variabile, Apogeo.

Further references:

• M. Conti, D.L. Ferrario, S. Terracini, G. Verzini. Analisi Matematica VOL. 1. Apogeo.

Semester

First semester, October - January

Assessment method

The exam consists of a written part - in which the student is required to solve some exercises - and an oral part. To take the oral exam, students must pass the written part. During the oral test the student will have to demonstrate knowledge of the main definitions and the main theorems presented in the course. Any exercises not correctly solved in the written part can also be requested in the oral one. There will be 6 exam sessions scheduled during the year. Upon request, the exam may be held in English.

During the Covid-19 emergency period, exams will be carried out remotely, using the WebEx platform available through the e-learning page of the course.

Office hours

By appointment: andrea.raimondo@unimib.it